SOME NEMATODES FROM AUSTRALIAN BIRDS OF PREY

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[Read 10 April 1941]

This paper is based on material collected over a period of years from different parts of Australia. We are indebted to the late Dr. T. L. Bancroft (Eidsvold, Burnett River, Queensland), the late Dr. MacGillivray, Professor J. B. Cleland, Dr. A. Randall, Mr. J. T. Gray (Orroroo, S.A.), and the Queensland Museum for some of the parasites examined. Most of the remainder were collected by the senior author. The work was made possible by the Commonwealth Research Grant to the University of Adelaide. Types of the new species described have been deposited in the South Australian Museum. The following is a list of parasites arranged under their hosts:

Falco longipennis Swainson (Orroroo, Gawler, and Lake Alexandrina, S. Aust.; Burracoppin, W. Aust.), *Serratospiculum guttatum* (Schneider).

Falco peregrinus Tunstall (Moorook, S. Aust.), *Serratospiculum guttatum* (Schneider).

Falco melanogenys Gould (Macdonald Downs, Central Aust.), *Serratospiculum guttatum* (Schneider).

Nisaetus morphnoides Gould (Lake Frome, S. Aust.), *Porrocaecum cercinum* n. sp.

Circus assimilis Jardine (Orroroo, S. Aust.), *Porrocaecum circinum* n. sp.

Astur novae-hollandiae Gmelin (North Queensland), *Thelazia equilina* Baylis; (Brisbane), *Porrocaecum circinum* n. sp.

Accipiter cirrhocephalus Vieill. (Eidsvold), *Hamatospiculum* sp. (? *mcneilli*).

Hieracidea berigora Vig. and Horsf. (Eidsvold), *Bancroftinema dentatum*, n. g., n. sp.

Hieracidea orientalis Schlegel (Flinders Is., Bass Strait), *Acuaria flindersi*, n. sp., *Physaloptera hieracideae* n. sp.

Cerchneis cenchroides Vig. and Horsf. (West Burleigh, South Queensland), *Habronema paraleptoptera* n. sp.

Ninox connivens Lath. (Eidsvold), *Seuratinema brevicaudatum* n. g., n. sp.

Ninox rufa Gould (North Queensland), *Hamatospiculum mcneilli* J. & M.

Ninox boobook Lath. (Burnett River, Queensland), *Hamatospiculum mcneilli* J. & M.

Ninox strenua Gould (Burnett River, Queensland), *Subulura* sp.

Porrocaecum circinum n. sp.

(Fig. 1)

From the spotted harrier, *Circus assimilis* (type host), (Orroroo; coll., J. T. Gray), the little eagle, *Nisaetus morphnoides* (Lake Frome, S. Aust.), and the white goshawk, *Astur novae-hollandiae* (Brisbane—Queensland Museum). Complete specimens not present. Material consisting of anterior parts of females up to 100 mm. long, posterior parts of females up to 20 mm.; and the anterior parts of narrower worms, either males or immature females, without genital organs. Maximum width 1·5 mm. Head narrower than succeeding body. Dentigerous ridge on anterior inner surface of each lip continuing along edge of cuticular wing-like expansion on each side of lip, and extending nearly to its base. Interlabia less than half length of lips, each joined anteriorly on its inner surface to adjacent lips; two papillae on dorsal lip, one on each ventral. Oesophagus 3·7-4·3 mm. long, including ventriculus ·32 mm. long. Intestinal caecum wide, half to two-thirds oesophageal length. Nerve ring about ·7-·8 mm. from head

end. Vulva not observed, only female fragment long enough to be likely to include it being very much coiled and twisted. Eggs subglobular, about 90-100 μ in diameter.

These worms differ from *P. angusticolle* in total length, in the relative length of oesophagus, and the size and shape of the eggs. The absence of males in our material, and of measurements of the oesophagus and intestinal caecum in accounts of previously described species, makes comparison with other forms difficult.

Physaloptera hieracideae n. sp.

(Fig. 2-3)

From the brown hawk, *Hieracidea orientalis,* from Flinders Island, Bass Strait. Several poorly preserved females; only external features distinguishable. Length 17-18 mm., maximum breadth ·8 mm. Cuticular collar barely covering

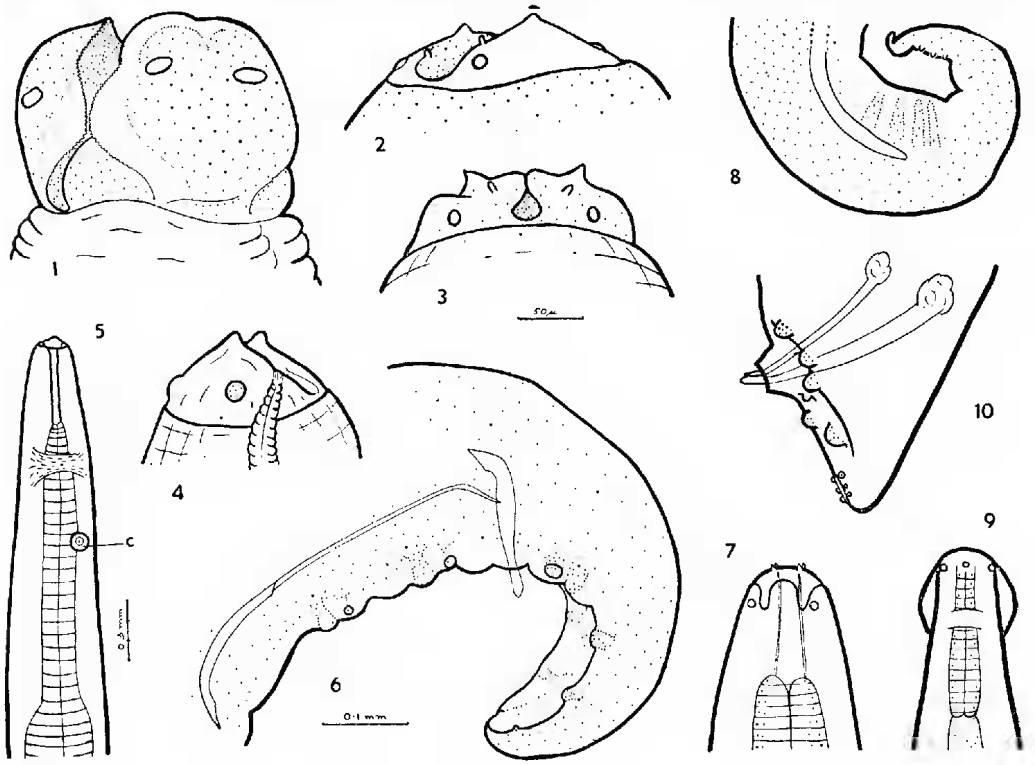

Fig 1, *Porrocaecum circinum:* head. Fig. 2-3, *Physaloptera hieracideae:* sublateral and ventral views of head. Fig. 4-6, *Acuaria flindersi:* 4, head; 5, anterior end; 6, male tail. Fig. 7-8, *Habronema paraleptoptera:* 7, head; 8, male tail. Fig. 9-10, *Seuratinema brevicaudatum:* 9, head; 10, male tail. Fig. 1, 6, and 10 to same scale; fig. 2, 3, 4, and 8. C, cervical papilla.

base of lips. Each lateral lip with one median conical tooth, two smaller lateral stylet-shaped teeth on inner border, and two papillae externally. Median teeth apparently not meeting in midline when head seen in dorsal or ventral view (fig. 3). Oesophagus 2·8 mm. long. Tail pointed, ·3 mm. long. The arrangement of the teeth distinguishes this species from other Physalopterids known from birds.

Acuaria flindersi n. sp.

(Fig. 4-6)

From *Hieracidea orientalis*, Flinders Island. Male 14·5 mm., female 16·9 to 18 mm. long; maximum breadth ·5 mm. Cordons rather faint, disappearing beyond 4 mm. from head. Lips each with two large papillae. Mouth leads to

vestibule ·25 mm. long, ·03 mm. wide; anterior part of oesophagus ·9 mm., posterior part 4·3 mm. in length; nerve ring ·4 mm. from head. Measurements from female.

Male: longer spicule ·51 mm. in length, tubular proximally, narrowed distally; shorter spicule ·18 mm. long, spatulate with blunt tip. Caudal alae narrow, extending ·7 mm. in front of posterior end; on each side two large and two smaller precloacal, four postcloacal, and near posterior end of ala one small rounded papilla.

Female: tail ·15 mm. long. Vulva 5·5 mm. in front of posterior end, a third of body length from tail. Eggs, 36-38 μ by 25-26 μ.

Differs from *A. indica* Maplestone and *A. corvicola* J. & M. in length of cordons and position of vulva.

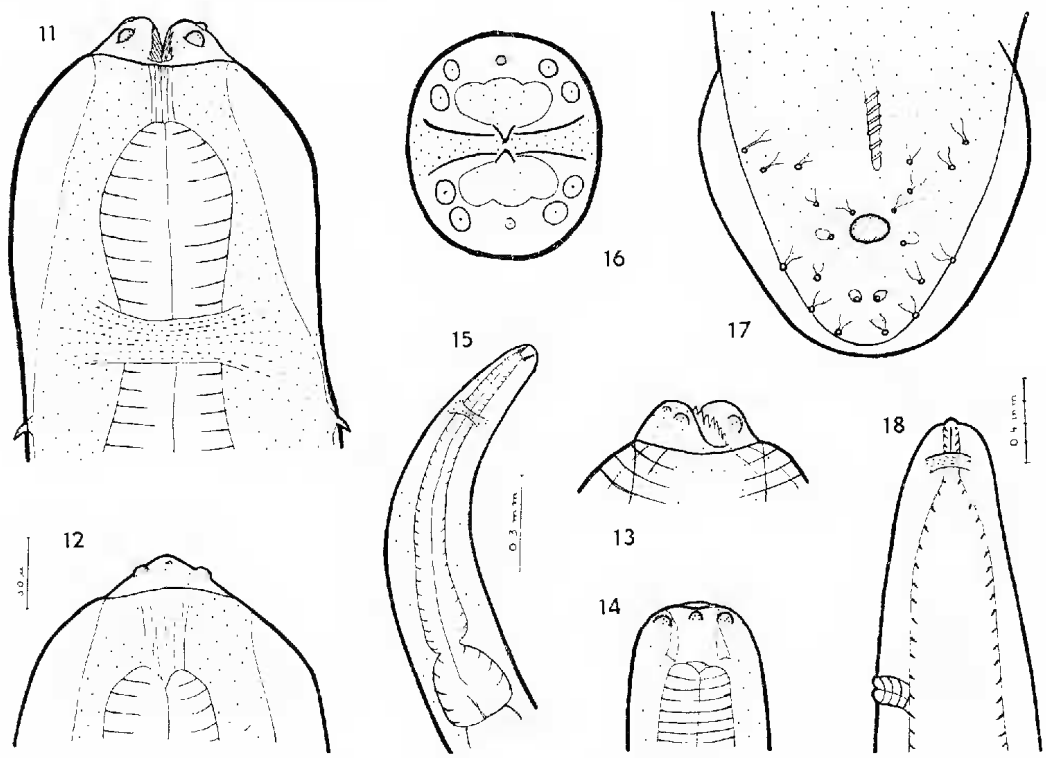

Fig. 11-13, *Bancroftinema dentatum:* ventral, lateral and sub-lateral views of head. Fig. 14-15, *Subulura* sp.: 14, head; 15, anterior end. Fig. 16-17, *Serratospiculum guttatum:* 16, head, anterior view; 17, male tail. Fig. 18, *Hamatospiculum* sp. from *Accipiter cirrhocephalus*, anterior end. All fig. except 15 and 18 to same scale.

Habronema paraleptoptera n. sp.

(Fig. 7-8)

From stomach of the kestrel, *Cerchneis cenchroides*, from West Burleigh, South Queensland. Material consisting of two males 10 mm. and 6·3 mm. long, their widths ·21 and ·1 mm. respectively; and posterior 9·8 mm. of a female. Specimens so slender and fragile that only a lateral view of head could be obtained. At least two, possibly three, teeth on each lateral lip; median of the three external lobes of each lateral lip slightly larger, the two outer each with large papilla; dorsal and ventral lips not visible from lateral aspect. Vestibule

12 μ wide; oesophagus commencing 38 μ from top of lips. In male 10 mm. in length, oesophagus 1·8 mm. long, nerve ring ·2 mm., and cervical papillae ·17 mm. from head end. Lateral alae about a quarter body length.

Male: tail with caudal alae about ·2 mm. long, reaching to within ·05 mm. of bluntly rounded tip. At least four pairs pedunculated preanal papillae, and three pairs small sessile postanal papillae. Tail 1·2 mm. long. Spicules in longer male ·35 mm. and 1·1 mm. in length; in shorter male shorter spicule ·3 mm., longer spicule very fine and its termination not observed.

Female: Vulva not present in only available piece. Tail ·31 mm. long, pointed. Eggs, thick-shelled, 25-30 μ by 12-15 μ.

The species closely resembles *H. leptoptera* (Rud.), but differs in the relative sizes of the lobes of the lips, the position of the nerve ring and excretory pore, and the size of the eggs. In spite of our inadequate study, these differences suggest that we are dealing with a new species.

Seuratinema brevicaudatum n. g., n.sp.

(Fig. 9-10)

From the winking owl, *Ninox connivens,* from the Burnett River (coll., Dr. Bancroft). One male present, 18 mm. long, ·5 mm. wide. Head rounded, with a pair lateral and two pairs larger submedian papillae; cuticle behind these inflated for distance of ·25 mm. Oesophagus ·5 mm. long, widening at base; nerve ring ·25 mm. from head. Posterior end bluntly pointed. Cloaca ·16 mm. from tip of tail, on prominence with four pairs pericloacal papillae at its base; posterior to these are one median and two lateral papillae; near tip of tail three pairs smaller papillae. Spicules subequal, about ·22-·25 mm. long, both tapering, shorter slightly thinner.

The combined characters of the head, tail and oesophagus suggest a new genus, diagnosed as follows:

Seuratinae: head rounded, cuticle behind head inflated for short distance. Buccal capsule absent; oesophagus short, muscular. Male: tail short, conical, with papillae not in linear row; no caudal alae; spicules subequal, short. Female unknown. Parasites of birds. Type species, *Seuratinema brevicaudatum* n. sp.

The genus appears to be nearest *Seuratum,* from which it differs in the absence of longitudinal bands on the cuticle, in the presence of inflated cervical cuticle, and in possessing a shorter male tail. It differs from genera of Thelaziidae in the absence of a buccal capsule, the presence of cervical inflation, the shortness of the male tail, the arrangement of the caudal papillae, and the length of the oesophagus.

Bancroftinema dentatum n. g., n. sp.

(Fig. 11-13)

From *Hieracidea berigora* from Eidsvold, Queensland (coll., Dr. Bancroft). Two females present, 2-2·5 cm. long, ·13-·15 mm. wide; body tapering anteriorly; tail rounded. Two more or less crescentic lateral lips, each with a small median and two large lateral papillae. Oesophagus commencing 70 μ from front of lips. From this level numerous (20-30 ?) chitinised rods extend forwards along inner surface of each lip to terminate in tooth-like points. These form a sort of buccal capsule, of which the dorso-ventral diameter is much greater than that from side to side, and of which the walls are longer in the centre than dorsally and ventrally. Cuticle inflated behind lips and extending backwards for about ·25 mm. Two parts of oesophagus not readily distinguishable, total length 2·5 mm.; nerve ring ·25 mm. from head, surrounding a constriction in oesophagus. Cervical papillae hook-like, posteriorly directed, small, ·1 mm. behind posterior end of cuticular inflation. Vulva just anterior to middle of oesophagus; two uteri filled with thick-shelled eggs about 50 μ by 25-30 μ, each containing a coiled larva.

Owing to the absence of males we have been compelled to depend mainly on the characters of the head and oesophagus to determine the systematic position of this genus. The presence of two well-marked lateral "pseudolabia" suggests the Physalopteridae, but it differs from members of that family in having a well-developed stoma. The Spiruridae have a well-developed stoma but the pseudolabia are usually small, and cephalic papillae are situated posterior to them. Our genus then appears to lie between the Spiruridae and the Physalopteridae as outlined by Chitwood and Wehr (1934). The genus *Bancroftinema* is diagnosed as follows:

Spiruroidea: with two lateral lips, each with three papillae. Buccal capsule present, narrower laterally than dorso-ventrally, its walls formed of rods arranged vertically side by side each ending in a tooth-like point on inner margin of lips. Cervical cuticle inflated. Oesophagus long, two parts not distinct. Vulva oesophageal. Parasites of birds. Type species *Bancroftinema dentatum* n. sp.

The genus differs from *Seuratinema* in the presence of lips and in the possession of an armed stoma.

Thelazia aquilina Baylis

From *Astur novae-hollandiae,* collected by Dr. MacGillivray in North Queensland. Several specimens of both sexes were examined. They agree essentially with Baylis' description (1934). Our specimens are shorter and stouter; the males show only three pairs of post-anal papillae. the third however is indistinct and large, and may comprise two small ones close together.

Subulura sp.

(Fig. 14-15)

From *Ninox strenua,* Eidsvold, Queensland. One poorly preserved female present, 9·5 mm. long. Vestibule 49 μ long, 29 μ wide; oesophagus 1·2 mm. long, its terminal bulb ·25 mm. long, ·2 mm. wide. Nerve ring ·28 mm., and excretory pore ·34 mm. from head end. Tail ·755 mm. long; vulva at mid-body; eggs 30-32 μ by 22 μ. Possibly owing to the density of the worm, teeth were not observed in buccal cavity. In the absence of males this species cannot be compared satisfactorily with recognised species.

Serratospiculum guttatum (Schneider)

(Fig. 20-21)

Specimens were obtained from *Falco longipennis,* from Orroroo, S. Aust. (coll., F. T. Gray and S. Aust. Museum), Lake Alexandrina, S. Aust. (coll., Dr. A. S. Randall), Burracoppin, W. Aust. (coll. Dr. Cleland), and Gawler, S. Aust.; *Falco peregrinus* from Moorook, S. Aust.; and from *Falco melanogenys* from Macdonald Downs, Central Australia. All the specimens examined appear to belong to the same species, although those from *F. peregrinus* are larger. The measurements given are, unless otherwise stated, of males and females from *F. longipennis.*

Males 80 mm. long, females 100-200 mm., maximum width 1 mm. (Males and females from *F. peregrinus* 160 mm. and 290 mm. long respectively, 2 mm. maximum width.) Epaulette structures on head poorly developed; four pairs submedian papillae large; laterals very small. Median anterior projection on each lip short. Narrow anterior part of oesophagus ·35 mm. long in female, ·32 mm. in male; posterior part 10 mm. in female 200 mm. long; nerve ring around anterior part, about its middle.

Male: spicules of typical shape, longer ·62 mm., shorter ·3 mm. in length (1·13 mm. and ·5 mm. in specimens from *F. peregrinus*), *i.e.,* shorter spicule

about half length of longer. Caudal alae ·22 mm. long; cloaca 90 μ from tip of tail. Caudal papillae pedunculate, five pairs preanal, six pairs postanal, their arrangement being remarkably constant in all specimens examined.

Female: anus 60 μ in front of tip of rounded tail. Vulva near beginning of glandular part of oesophagus, ·8 mm. from head in 200 mm. long worm. All females except those from *F. peregrinus* covered with small cuticular bosses. Eggs, 50 μ by 30-25 μ.

The worms differ from *Filaria attenuata* Rud., 1819, as described by Seurat 1915, in being longer, in having a relatively shorter oesophagus, a pair of lateral cephalic papillae, and in the arrangement of the postanal papillae in the male. It agrees with Schneider's *Filaria guttata,* described in 1866 from *Falco berigora* from Adelaide. Seurat placed the species as a synonym of Rudolphi's *F. attenuata* (from *Falco peregrinus*), in spite of the fact that Schneider redescribed Rudolphi's material at the same time as he published his own account of *F. guttata.* Baylis (1925, 112) recorded *S. attenuatum* from *Falco longipennis* from St. George, Southern Queensland, quoting as a synonym *Filaria guttata* Schneider.

Hamatospiculum mcneilli J. & M.

This species, originally described from *Ninox boobook,* from Hayman Island, Queensland, is now recorded from the same host from the Burnett River, Queensland, and from *Ninox rufa,* collected by Dr. MacGillivray in North Queensland.

Hamatospiculum sp.

(Fig. 18)

Part of a female worm probably referable to this genus was obtained from *Accipiter cirrhocephalus* at Eidsvold by Dr. Bancroft. Such features as can be made out, suggest *H. mcneilli* J. & M.

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Note—To bring our host names into line with those given in the "Official checklist of the birds of Australia" (1926), the following alterations are necessary: *Falco melanogenys* = *F. peregrinus; Nisaetus morphnoides* = *Hieraaetus m.; Hieracidea berigora* (syn. *H. orientalis*) = *Falco b.; Cerchneis cenchroides* = *Falco c.*